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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BAKER, STEPHEN M	

ART UNIT	PAPER NUMBER
2112	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/757,260	VITYAEV, ANDREI	
	Examiner	Art Unit	
	Stephen M. Baker	2112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27,30 and 31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11-25* is/are allowed.

6)☒ Claim(s) *1,2,4,5,7-10,26,27,30 and 31* is/are rejected.

7)☒ Claim(s) *3 and 6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

According to applicant's arguments, on page 16, in line 6, "In one embodiment" apparently should be "In the same embodiment," however it is not entirely clear that this does not add new matter.

In the error correction coding art it is conventional to designate the number of random symbol errors correctable by an (***n***, ***k***) Reed-Solomon code as ***t*** wherein the Reed-Solomon code adds (***n*** - ***k***) = ***r*** = 2***t*** redundant symbols to ***k*** data symbols. The conventional Reed-Solomon code has a generator polynomial with 2***t*** consecutive roots and a degree of 2***t***. Applicant's parameters "t" and "k" do not correspond to ***t*** and ***k*** in the standard variable notation described above and thus applicant's choice of variable names is confusing.

Applicant's disclosure does not relate applicant's parameters "t" and "k" to any code generator polynomial design objective, other than doing so indirectly through the sum "(2t + 2k)" is equal to the number of redundant symbols, normally represented as (***n*** - ***k***) = ***r*** = 2***t*** redundant symbols. Accordingly, applicant's parameters "t" and "k" are seen as being entirely arbitrary, in the context of the encoding. Furthermore, applicant's parameters "t" and "k" are described as inevitably being equal to each other (at least according to the equation for the first polynomial in paragraph 0016, where "t" is

replaced by "k"), and are only used after a multiplication by two which factor also lacks any described relation to any code generator polynomial design objective.

It's furthermore noted that it's well known in the Reed-Solomon coding art that adding one redundancy symbol (*i.e.* adding one more consecutive root to the generator polynomial) adds the ability to locate one more symbol in error (which is erasure location and a form of error detection) and that adding a second redundancy symbol adds the ability to correct a located error (which is erasure correction), and correspondingly it's well known that adding two redundancy symbols adds the ability to correct one more unknown error symbol. In other words, it's well known that r redundancy symbols can correct t errors and e erasures, for any values of t and e chosen such that $r = (2t + e)$ and, equivalently, it's well known that r redundancy symbols can correct t errors and detect d errors, for t and e chosen such that $r = (2t + d)$. In other words, it is not the number of roots (r –x + x) in applicant's first and second polynomials that respectively defines the error correction and error detection capacities of the product generator polynomial, but it is the number of roots r in the product polynomial that determines these capacities conventionally, according to $r = (2t + d)$. Accordingly, applicant's generator polynomial selection process appears to be an artificial and arbitrary breaking up of the conventional process of selecting $r = (2t + d)$ or $2t$ (in the case of error-correction-only decoding) consecutive roots into a two-part process of selecting two consecutively-positioned consecutive sets roots to arrive at $r = (2t + d)$ or $r = 2t$

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 26, 27, 30 and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,363,511 to Massoudi *et al* (hereafter "Massoudi").

Massoudi discloses a decoder (Fig. 4B) for Reed-Solomon product-code codewords, including two stages of correction (410, 414). Massoudi also mentions the possibility of a software-based implementation (column 13). Massoudi's row correction stage (410) provides a "first processing stage used to correct a first maximum number of symbol errors in said encoded codeword," using the correction power of the row codewords. The number of errors correctable in row-decoding is of course inherently equal to half the number of check symbols in each row (and also half the degree of the row code generator polynomial) times the number of rows. Massoudi's column and EDC syndrome generator stage (412) provides a "second processing stage used to detect symbol errors" as an EDC is an error detection code. Massoudi's column correction stage (414) provides a "third processing stage used to correct a second maximum number of symbol errors in said encoded codeword." The number of errors correctable in column-decoding is of course inherently equal to half the number of check symbols in each column (and also half the degree of the column code generator polynomial) times the number of columns.

Massoudi's row correction uses 10 redundant symbols per row and Massoudi's column correction uses 16 redundant symbols, capable of correcting more errors (8 errors correctable per column correction vs. 5 errors correctable per row correction, using the DVD standard product code. Consequently, Massoudi's first error correction stage corrects up a first number (5) of errors per row codeword, while Massoudi's second error correction stage corrects up a sum of a first number (5) and a second number (3) of errors for a total of 8 errors correctable in Massoudi's second stage per column codeword. Both the first and second numbers (5 and 3) can be said to respectively correspond to half the degrees of any polynomials of degree 10 and 6, consecutive roots or not.

4. Claims 1, 2, 4, 5, 7 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,978,415 to Weng (hereafter "Weng '415").

Weng '415 discloses (column 4, lines 32-40) selecting a generator polynomial $g(x)$ for a Reed-Solomon code as a product of a first polynomial and a second polynomial, $g(x) = g_1(x) \cdot g_2(x)$. The recited decoding purposes for selecting the first and second polynomials in encoding is given no patentable weight, it being understood that well-known capabilities for error correction and for error detection decoding are inherent in both $g_1(x)$ and in $g_2(x)$ used in encoding. Of course the error correction powers of $g_1(x)$ and $g_2(x)$ are inherently equal to one-half their respective degrees, by definition, and both $g_1(x)$ and $g_2(x)$ have roots that are powers of a primitive field (e.g. as in column 6, line 40).

Regarding claims 5 and 10, the codewords of Weng '415's Reed-Solomon code are for writing to a magnetic disk drive.

Regarding claim 7, generating a Reed-Solomon codeword inherently requires dividing an information polynomial ("third polynomial") by the generator polynomial ("said product") and using the remainder as the code's redundancy symbols.

Claim Rejections - 35 USC § 103

5. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weng '415 in view of U.S. Patent No. 5,948,117 to Weng *et al* (hereafter "Weng '117"), or in view of U.S. Patent No. 5,778,009 to Fredrickson *et al* (hereafter "Fredrickson").

Weng '417 does not mention Reed-Solomon codes with 10-bit symbols (Reed-Solomon codes defined over GF(2^{10}). Official Notice is taken that the usefulness of using a Reed-Solomon code defined over GF(2^{10}) for encoding data to be stored in magnetic disk drives was well-known at the time the invention was made, as evidenced by Fredrickson and Weng '117. Fredrickson's code generator polynomial has symbols in GF(2^{10}) meaning the symbols are 10-bit symbols, the maximum code length is (2^{10}-1) = 1023 symbols, so a single codeword can fill an entire sector.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to implement the generator polynomial selection process disclosed by Weng '415 by using polynomials defined over GF(2^{10}). Such an implementation would have been obvious because that the usefulness of using a Reed-

Solomon code defined over GF(2^{10}) for encoding data to be stored in magnetic disk drives was already well-known.

Allowable Subject Matter

6. Claims 3 and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claims 11-25 are allowed.

Response to Arguments

8. Applicant's arguments filed 02 April 2007 have been fully considered but they are not persuasive.

Inherent aspects of the standing rejections have been elaborated upon to address applicant's misapprehensions.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (571) 272-3814. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacques H. Louis-Jacques can be reached on (571) 272-6962. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Stephen M. Baker

Primary Examiner
Art Unit 2112

smb